



Idaho State Department of Agriculture
Division of Agricultural Resources

Testing for Oust® and other
Previously Untested Pesticides in
Idaho Ground Water

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Introduction

In 2002, the Idaho State Department of Agriculture (ISDA) Ground Water Program was awarded a grant by the Environmental Protection Agency (EPA) to test ground water for select pesticide compounds. The grant provided resources to test 42 domestic wells in 12 counties across the state (Figure 1). The testing was undertaken due to known concerns in 2001 from the pesticide Oust® in south central and eastern Idaho and the need to check for previously untested pesticides that have potential to leach to ground water (Table 1).

Analytical services were provided by the Montana State University (MSU) Agricultural Experimental Station Analytical Laboratory (MSU Analytical Laboratory) in Bozeman, Montana. The MSU Analytical Laboratory was chosen due to their expertise with methods used with a liquid chromatography/mass spectrometry/mass spectrometry (LC/MS/MS) machine. The MSU Analytical Laboratory also has extensive experience in testing for the pesticides of interest.

Additionally, the testing was completed to evaluate the need to add these extra pesticides to ISDA's ground water pesticide monitoring program. Currently, the ISDA water program is testing for 120 different pesticide compounds exclusive to those tested for in this study. The University of Idaho Analytical Sciences Laboratory (UIASL) in Moscow, Idaho handles ISDA's normal sample work load. However, capabilities to test for the compounds evaluated in this project were not available to UIASL at the time of sample collection. The UIASL in Moscow recently added a LC/MS/MS machine to their facilities and may add these methods in the future.

Background

In the spring of 2002, farmers became aware of problems with spring growing conditions causing adverse effects on the growth of newly planted sugar

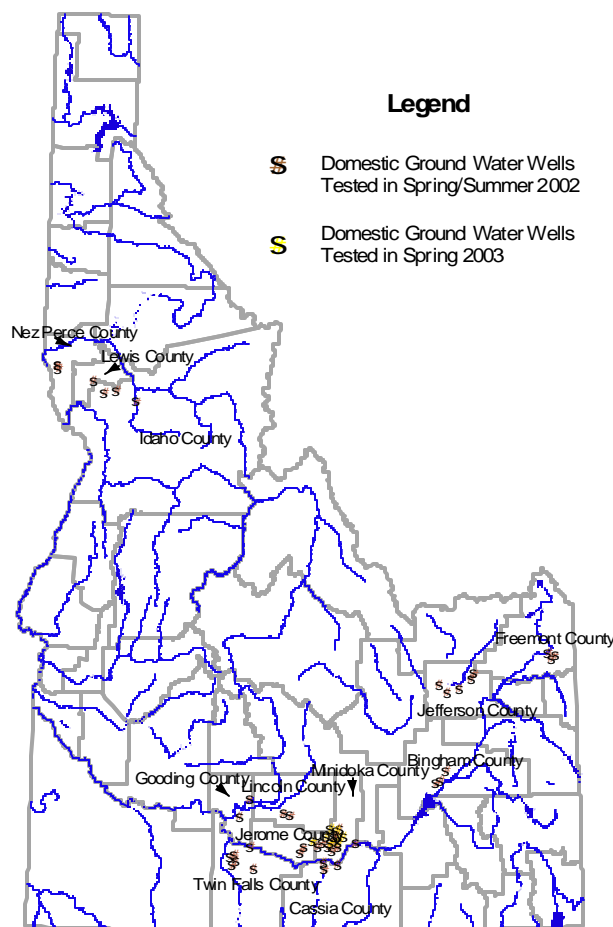


Figure 1. Locations of ground water wells tested for new pesticides.

beet crops in south-central Idaho Counties, primarily in areas of Minidoka County. Initial planting of sugar beets produced plants which grew to approximately three to four inches in height and then withered and died (Bob Spencer, 2003). Several subsequent replants resulted in a similar fate. It also was evident at the time that wheat and barley crops adjacent to United States Bureau of Land Management (BLM) properties also were not faring well (Bob Spencer, 2003). Later in the growing season detrimental effects to local potato crop quality also became apparent. In addition, complaints of wind erosion problems from burnt areas on BLM

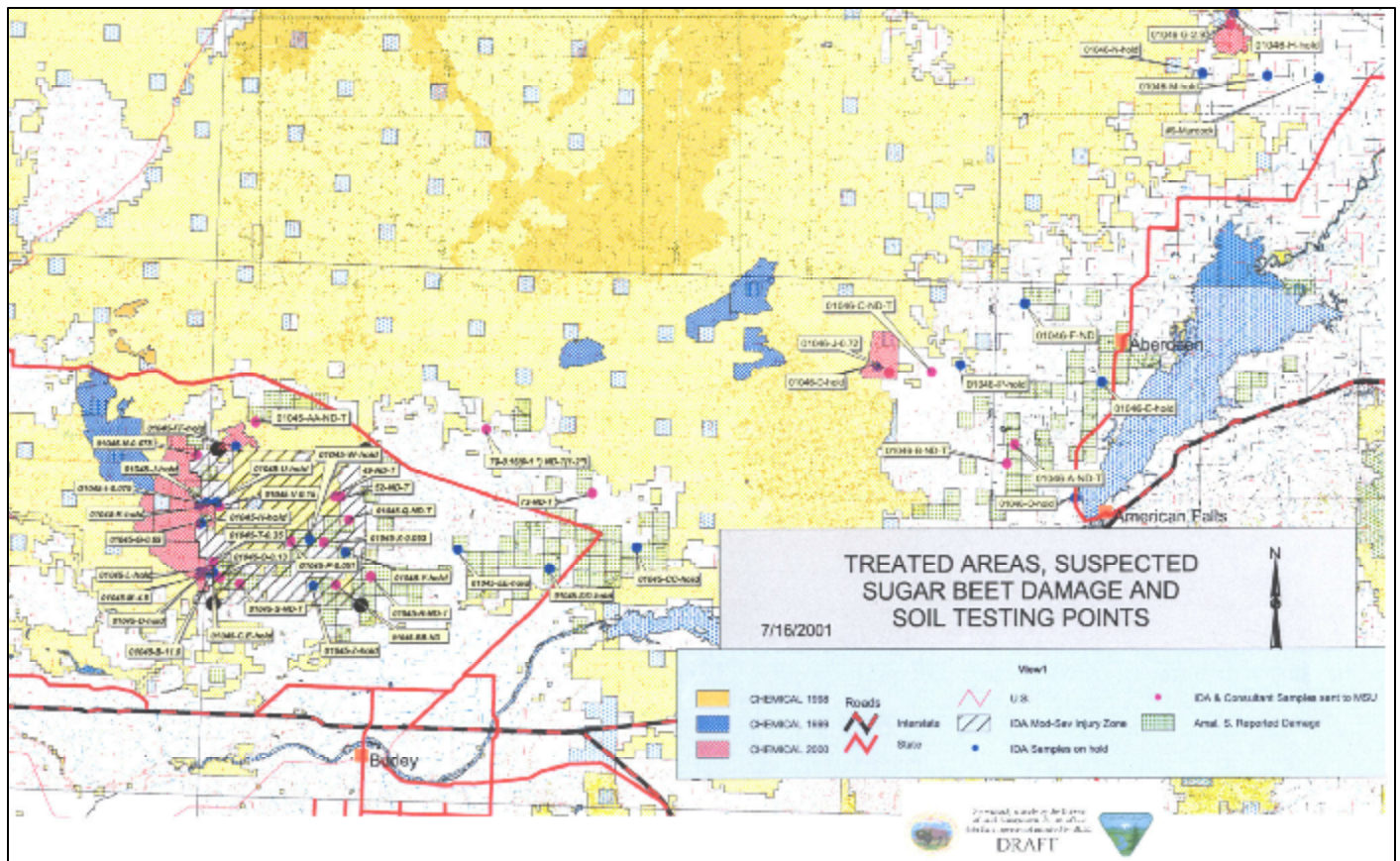


Figure 2. Locations of Oust® treated areas, crop damaged locations, and soil testing sites in Southern Idaho near Burley, American Falls, and Aberdeen. (Courtesy of the BLM, 2001).

property were reported to BLM officials by an area farmer (Bob Spencer, 2003). It was believed at that time that wind transport of Oust® laced soils was a likely source of the problem based on (1) drought conditions in the area, (2) known aerial and ground applications of the herbicide Oust® to control cheat grass by BLM in the preceding fall, and (3) crop failure problems. Requests were made to local industry officials and University of Idaho extension professionals, as well as to ISDA to investigate the problem. Subsequent plant tissue testing for a number of synthetic growth inhibitor compounds (Assert®, Harmony Extra®, Matrix®, and Oust®) as well as the herbicide compound metribuzin revealed no positive detections. However, testing of soils in the area revealed numerous positive detects of the herbicide Oust®, three low level detections of metribuzin, and an isolated low level detection of Assert® (Figure 2).

ISDA Water Program staff originally drafted a proposal to test ground water in the Minidoka County area to investigate possible impacts to ground water from Oust®. The proposed study was deemed necessary because of the high susceptibility of ground water quality in Minidoka County due to injection wells, shallow ground water, and sandy soils. ISDA Water

Program staff later decided to include in the proposal an effort to test for other new or recently registered pesticides that had not previously been tested for in Idaho. Specifically, pesticides containing sulfonylureas (Oust®, Glean®, Ally®, Accent®), tralkoxydim (Achieve®), and imidazolinone (Assert®) were chosen because of known impacts to ground water, for some of these compounds, in the state of Montana (Table 1). Also, these compounds are routinely used in Idaho. The compounds are utilized for the following uses: Oust® for noncrop, turf, and forestry; Glean® for wheat, barley, and oats; Ally® for wheat, barley, fallow, pastures, and rangelands; Accent® for field corn, seed corn, and popcorn; Achieve® for wheat and barley; and Assert® for wheat and barley.

Methods

Well location sites for ground water samples in Minidoka County were selected based on areas having known soil contamination from Oust® (Figures 1 and 2). Three well sites were also selected in Bingham County downwind of another BLM Oust® application area and near a soil sample site with a positive detection for Oust®. Sample locations were chosen from a preexisting ISDA regional ground water sampling

Table 1. Locations and chemical constituents evaluated from ground water.

County	Sites	Year	Chemical Name	Common Name
Jefferson	5	2002	Tralkoxydim	Achieve®
Cassia	4	2002	Tralkoxydim	Achieve®
Bingham	3	2002	Sulfonylureas	Oust®, Glean®, Ally®
Twin Falls	6	2002	Sulfonylureas	Accent®
Lewis	3	2002	Imidazolinone	Assert®
Nez Perce and Idaho	4	2002	Imidazolinone	Assert®
Minidoka	8	2002	Tralkoxydim, Imidazolinone, Sulfonylureas,	Achieve®, Assert®, Oust®, Glean®, Ally®
Gooding	2	2002	Imidazolinone, Sulfonylureas,	Assert®, Oust®, Glean®, Ally®, Accent®
Jerome	2	2002	Imidazolinone, Sulfonylureas	Assert®, Oust®, Glean®, Ally®
Lincoln	2	2002	Imidazolinone, Sulfonylureas	Assert®, Oust®, Glean®, Ally®
Fremont	3	2002	Tralkoxydim, Imidazolinone	Achieve®, Assert®
Minidoka	8	2003	Sulfonylureas	Oust®, Glean®, Ally®, Accent®

network of domestic wells established in both Minidoka and Bingham Counties.

For all pesticides other than Oust®, emphasis was placed in counties having high sales of the various compounds that ISDA water program staff chose for project focus. Consultation by George Robinson (ISDA Pesticide Registration Program Manager) with the manufacturer representatives was critical in this effort. As with the Oust® monitoring effort, sites were selected from preexisting ISDA regional sampling projects using privately owned domestic wells.

All sample collections followed established ISDA protocols (on file at the ISDA main office) for handling, storage, and shipping of pesticide water samples. Samples were sent to the MSU Analytical Laboratory via FedEx one day express shipping. Ten percent duplicate samples were collected and submitted to the laboratory in addition to original samples for evaluation of laboratory testing results. Testing of water samples by the MSU Analytical Laboratory was completed following laboratory protocols for pesticide testing. Testing for sulfonylurea compounds including Oust® was completed by the laboratory with a quantification limit of 0.020 micrograms per liter (µg/L). Testing for tralkoxydim and imidazolinone compounds was completed by the laboratory with quantification limits of 0.050 µg/L and 0.20 µg/L, respectively.

General Descriptions of Project Areas

Minidoka, Jerome, Gooding, Lincoln, and Bingham Counties

Minidoka, Jerome, Gooding, and Lincoln Counties lie adjacent to each other north of the Snake River with Bingham County situated about 50 miles to the east of Minidoka County. All the counties lie within the southern boundary of the Eastern Snake River Plain (ESRP) (Figure 1). The area is dominantly rural agriculture with northern extents of each county being unpopulated rangelands. Larger population centers include the towns of Jerome, Gooding, Blackfoot, and Rupert. The climate is semi-arid.

Row crop agriculture dominates the agricultural activities in each county. Several counties, especially Gooding and Jerome, have a large number of dairy and other livestock operations. Local irrigation systems vary from the typical and historic practice of flood irrigation to more modern techniques of sprinkler irrigation. Major crops in the overall area include potatoes, sugar beets, wheat, barley, corn and beans (Idaho Agricultural Statistics Service, 2002).

Jefferson County

Jefferson County is situated in the northeastern portion of the ESRP east of the Snake River (Figure 1). The area is dominantly rural agriculture with most farming

activities centered around the Mud Lake area. Western areas of the county are unpopulated rangeland that also contain portions of the Idaho National Environmental Engineering Laboratory. Towns in this area include Mud Lake, Terreton, and Montview. The climate is semi-arid.

Land use within the Jefferson County area is primarily agriculture. Much of the area is dominated by irrigated agriculture. Corn, alfalfa, wheat, barley, oats, and potatoes are the chief crops grown in Jefferson County (Idaho Agricultural Statistical Services, 2002). Additionally, there are several small dairy operations and other livestock raising activities in the area.

Twin Falls County

Twin Falls County is situated south of the Snake River and south of the ESRP (Figure 1). The area is dominantly rural agriculture with the largest population center being Twin Falls with a population of 34,469 based on 2000 U.S. Census information (Areaconnect, 2003). Approximately 89 dairies are currently in operation within Twin Falls County (Carlson and Bahr, 2002). Some southern areas of the county are unpopulated rangeland. The climate of the county is semi-arid.

The largest number of acres in Twin Falls County are row crop agriculture. Based on IDWR land use data, over 90% of agricultural lands within the project area are irrigated by gravity flow leaving approximately 10% using sprinkler irrigation. Major crops in the area include alfalfa, grain, beans, potatoes, sugar beets, and corn (Idaho Agricultural Statistics Service, 2002).

Cassia County

Cassia County is situated south of the Snake River and south of the ESRP (Figure 1). The county is dominantly rural agriculture and has a population of 21,416 (US Census Bureau, 2003). The largest city is Burley along the Snake River. Approximately 12 dairies and numerous beef feedlots are currently in operation within Cassia County. Some southern areas of the county are unpopulated rangeland. The climate of the county is semi-arid.

The largest number of acres in Cassia County are range and agricultural. Based on IDWR land use data, there is a mixture of sprinkler and gravity flow irrigation systems. Major crops in the area include alfalfa, wheat, barley, oats, potatoes, sugar beets, and corn (Idaho Agricultural Statistics Service, 2002).

Idaho, Lewis, and Nez Perce Counties

Idaho, Lewis, and Nez Perce Counties are situated in north-central Idaho (Figure 1). Land use throughout these counties is dominantly dry land agriculture. The region also has a number of beef animal feeding operations and a few small dairy operations. Also, grazing occurs on pasture, range and forest land within the project areas. Lewiston, Moscow, Grangeville, Nez Perce, Lapwai, and Craigmont are some of the larger municipalities located within these counties. Land surface elevations range from about 750 feet in Lewiston to 4,500 feet near the southern boundary of Idaho County. Mean annual precipitation ranges from about 20 to 24 inches, with the dominant precipitation occurring as snow and rain during the winter and spring months.

Fremont County

Fremont County is situated on the eastern edge of the ESRP and borders the states of Wyoming to the east and Montana to the north (Figure 1). Northern and eastern areas of the county are dominated by forested mountainous areas. The southern and eastern extent of the county is dominantly rural with both irrigated and dry land agriculture. Larger towns in the county include Ashton, St. Anthony, Tetonia, and Marysville. Wheat, barley, oats, potatoes, corn, and alfalfa are the chief crops grown in Jefferson County (Idaho Agricultural Statistics Service, 2002). In addition, there are a number of small dairy operations and other livestock raising activities in the area.

Hydrogeology

Minidoka, Jerome, Gooding, Bingham, and Lincoln Counties

The ESRP Aquifer is the regional source of water for Minidoka, Jerome, Gooding, Lincoln, and Bingham County residents. Rocks of the ESRP Aquifer are made up primarily of a series of vesicular and fractured basalt flows of the Snake River Group. Well drillers' reports of wells indicate static water levels typically between 150-300 feet below ground surface.

Ground water movement of the ESRP Aquifer is generally from the Northeast to the Southwest. The Snake River area is a discharge point of ground water from the ESRP Aquifer via spring flow and seepage between Milner Dam and King Hill (Rupert, 1997).

Much of southern Minidoka County also contains an alluvial aquifer perched on top of clay layers, which separates the shallow alluvial aquifer from the deeper ESRP aquifer (Rupert, 1997). The aquifer is recharged mainly from infiltration of irrigation water with some shallow wells going dry after the end of the irrigation season (Rupert, 1997). Based on well drillers' reports from domestic wells in the area, typical depth to ground water ranges from zero to 50 feet. Data collected from the area suggests a relatively low gradient for the shallow system with direction of ground water flow to the north (Rupert, 1997; Mitchell, 1998)

Twin Falls County

Surface or near surface basalt flows underlie most of Twin Falls County. Based on well drillers' reports from wells sampled as part of ISDA regional monitoring efforts, depth to first ground water is variable ranging from about 10 feet to 300 feet below land surface (Carlson and Bahr, 2000). Drillers' reports indicate that the ground water aquifer is situated in fractured basaltic rocks with intercalated sands and gravels. General direction of ground water flow is to the northwest towards the Snake River which forms the northern boundary of the county.

Cassia County

The hydrogeology of Cassia County consists of an upper aquifer composed of alluvial deposits overlying a lower aquifer composed of fractured basalt. Based on well drillers' reports from domestic wells in the project area, typical depth to ground water is less than 50 feet below ground level in the upper aquifer and over 150 feet below ground level in the lower aquifer. The shallow aquifer is composed of alluvial deposits, mainly sand and gravel, with a few thin interbedded clay layers.

Jefferson County

Jefferson County lies within the boundary of the ESRP Aquifer. Although the ESRP is a major source for domestic use in the county, shallower alluvial aquifer zones also are a source of water in the Mud Lake Region of the County. Ground water depths near Mud Lake are greatest to the south of the lake, but get progressively shallower toward the northeast portion of the area. Within the monitoring area of this study, most domestic wells have depths of 200 to 300 feet. According to lithologic records from well driller reports, unconsolidated sands and clays appear in some areas between zero and 100 feet. However, the majority

of the domestic wells within the area are completed in water bearing zones of fractured and vesicular (cinders) basalt.

Idaho, Lewis, and Nez Perce Counties

Ground water aquifers in these counties are found in sand and gravel alluvial systems, fractured crystalline bedrock, interbedded or intercalated sedimentary material, and interflow zones of basalt flows. The sand and gravel aquifers are commonly found within the riverine environments of the Clearwater River, Lapwai Creek, and other smaller watersheds. Columbia River Basalt aquifers are found within the plateau upland areas. The geology of the area is comprised of faulted layers of Miocene Columbia River Basalt and bounded by igneous and metamorphic outcroppings such as the Idaho Batholith formations. The area is diverse with gently rolling hills of loess soil with steeper canyons formed by erosional processes.

Fremont County

Collection of samples from this county were taken in an area east of the Snake River. This area is generally an area of rolling hills with several deeply incised drainages. Ground water flow is generally east to west in the direction of the Snake River. Several small perched aquifers also appear in the area apparently created as a result of percolating irrigation and canal waters (Jorgensen Engineering and Land Surveying, 2000). Static water levels measured and reported by well drillers range from tens to hundreds of feet below land surface. Most wells in the area are completed within the basalt aquifer.

Results

Forty-two wells were sampled between late June and late August in 2002 (Figure 1 and Table 1). Wells were sampled for various constituents as indicated in Table 1 depending upon location. Of the wells tested in 2002 for sulfonylurea compounds, no detections were found above the laboratory detection limit of 0.020 µg/L. Of the wells tested in 2002, no detections above the quantification limits of 0.050 µg/L and 0.20 µg/L were found for tralkoxydim and imidazolinone compounds, respectively.

Because of discounts provided by the MSU Analytical Laboratory, enough funding was available to test an additional eight wells in 2003. Eight different wells were selected in the Minidoka area for monitoring and testing for sulfonylurea compounds and completed in

May of 2003. No detections were found above the laboratory detection limit of 0.020 µg/L.

Conclusions

Ground water monitoring results from this study suggest no ground water impacts from the pesticides evaluated, at least at the quantification limits of the testing method used by the laboratory. Results of this study suggest that in the wells sampled there were no direct impacts to ground water as a result of drifted soil containing Oust®. Results further suggest that legal use of the sulfonylurea, tralkoxydim, and imidazolinone compounds also are not impacting ground water in areas sampled.

Recommendations

No additional ground water testing for sulfonylurea, tralkoxydim, and imidazolinone compounds is needed at this time. As needed, future periodic monitoring for these compounds is recommended in areas of greatest use and vulnerability. ISDA water program staff may consider future testing in certain areas to ensure aquifer protection. Some of these compounds are potential leachers and have been found in other states. If feasible, these compounds could be added to ISDA's list of compounds that are being tested by the University of Idaho Analytical Sciences Laboratory.

ISDA personnel will continue to stress the importance to pesticide applicators to adhere to label requirements and to apply all pesticides according to federal and state laws. ISDA will continue to educate applicators in these efforts.

Acknowledgements

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